WATER SUPPLY OUTLOOK
and
FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS
for
WESTERN UNITED STATES
Including Columbia River Drainage in Canada

UNITED STATES DEPARTMENT of AGRICULTURE···SOIL CONSERVATION SERVICE
Collaborating with
CALIFORNIA DEPARTMENT of WATER RESOURCES
and
BRITISH COLUMBIA DEPARTMENT of
LANDS, FORESTS and WATER RESOURCES

AS OF
FEB. 1, 1964

UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

To Recipients of Water Supply Outlook Reports:

The climate of the cultivated and populated areas of the West is characterized by relatively dry summer months. Such precipitation as occurs falls mostly in the winter and early spring months when it is of little immediate benefit to growing crops. Most of this precipitation falls as mountain snow which stays on the ground for months, melting later to sustain streamflow during the period of greatest demand during late spring and summer. Thus, nature provides in mountain snow an imposing water storage facility.

The amount of water stored in mountain snow varies from place to place as well as from year to year and accordingly, so does the runoff of the streams. The best seasonal management of variable western water supplies results from advance estimates of the streamflow.

A snow survey consists of a series of about ten samples taken with specially designed snow sampling equipment along a permanently marked line, up to 1000 feet in length, called a snow course. The use of snow sampling equipment provides snow depth and water equivalent values for each sampling point. The average of these values is reported as the snow survey measurement for a snow course.

Snow surveys are made monthly or semi-monthly beginning in January or February and continue through the snow season until April, May or June. Currently more than 1400 western snow courses are measured each year. These measurements furnish the key data for water supply forecasts.

Streamflow forecasts are obtained by a comparison of total or maximum snow accumulation, as measured by snow water equivalent, to the subsequent spring and summer or snowmelt season runoff over a period of years. The snow water equivalent measured in selected snow courses provides most of the index to the streamflow forecast for the following season. More accurate forecasts are usually obtained when other factors such as soil moisture, base flow and spring precipitation are considered and included in the forecast procedure. Early season forecasts assume average climatic conditions through the snowmelt season.

Listed below are the Federal-State-Private Cooperative Snow Survey and Water Supply Forecast reports available for the West which contain detailed information on snow survey measurements, streamflow forecasts, reservoir storage, soil moisture and other guide data to water management and conservation decisions. Soil Conservation Service Reports may be secured from Water Supply Forecasting Unit, Soil Conservation Service, P.O. Box 2807, Portland, Oregon 97208.

PUBLISHED BY SOIL CONSERVATION SERVICE

REPORTS	ISSUED	LOCATION	COOPERATING WITH
RIVER BASINS			
Western United States	Monthly (Feb.-May)	Portland, Oregon	All Cooperators
Basic Data Summary	October 1	Portland, Oregon	All Cooperators
STATES			
Alaska	Monthly (Mar.-May)	Palmer, Alaska	Alaska S.C.D.
Arizona	Semi-Monthly (Jan. 15 - Apr. 1)	Phoenix, Arizona	Salt R. Valley Water Users Assoc. Ariz. Agr. Exp. Station
Colorado and New Mexico	Monthly (Feb.-May)	Fort Collins, Colorado	Colo. State University Colo. State Engineer N. Mex. State Engineer
Idaho	Monthly (Jan.-June)	Boise, Idaho	Idaho State Reclamation Engineer
Montana	Monthly (Jan.-June)	Bozeman, Montana	Mont. Agr. Exp. Station
Nevada	Monthly (Jan.-May)	Reno, Nevada	Nevada Dept. of Conservation and Natural Resources - Division of Water Resources
Oregon	Monthly (Jan.-June)	Portland, Oregon	Oreg. State University Oregon State Engineer
Utah	Monthly (Jan.-June)	Salt Lake City, Utah	Utah State Engineer
Washington	Monthly (Feb.-June)	Spokane, Washington	Wn. State Dept. of Conservation
Wyoming	Monthly (Feb.-June)	Casper, Wyoming	Wyoming State Engineer

PUBLISHED BY OTHER AGENCIES

REPORTS	ISSUED	AGENCY
British Columbia	Monthly (Feb.-June)	Water Resources Service, Dept. of Lands, Forest and Water Resources, Parliament Blog., Victoria, B.C., Canada
California	Monthly (Feb.-May)	Calif. Dept. of Water Resources, P.O. Box 388, Sacramento, Calif.

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ISSUED

FEBRUARY 1, 1964

The Soil Conservation Service coordinates snow surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Corps of Engineers, Forest Service, National Park Service, Geological Survey, and other Federal Agencies, Departments of State Government, Irrigation Districts, Power Companies, and others.

The Department of Water Resources coordinates snow surveys in California.

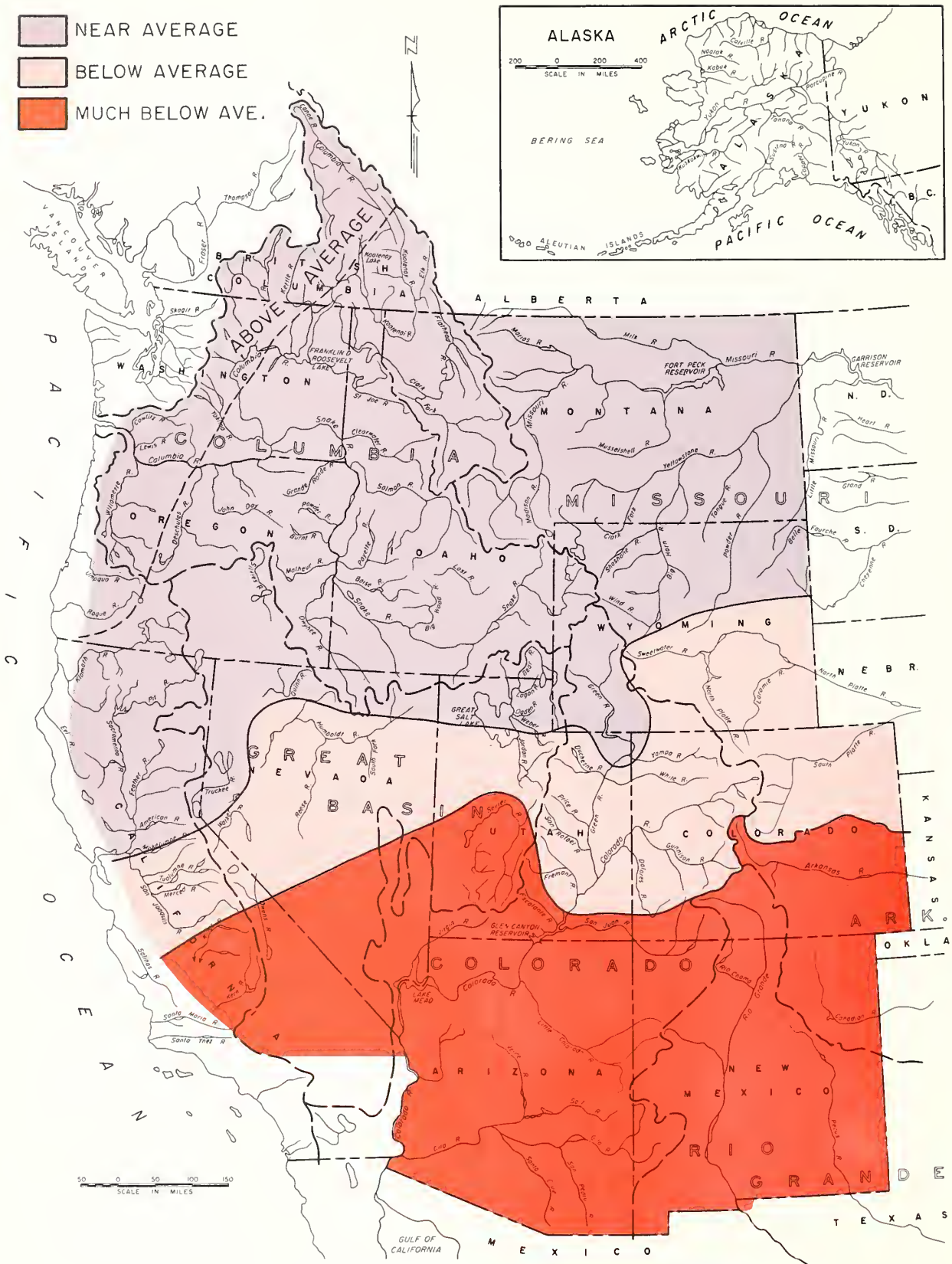
The Water Resources Service, Department of Lands, Forests, and Water Resources directs snow surveys in British Columbia.

This report was prepared by Homer J. Stockwell, under the direction of R. A. Work, Head, Water Supply Forecast Unit, Engineering Division, Soil Conservation Service, Portland, Oregon, from data supplied by Snow Survey Supervisors of the Soil Conservation Service: Arizona, Richard W. Enz; Colorado and New Mexico, Jack N. Washichek; Idaho, M. W. Nelson; Montana, Phil E. Farnes; Nevada, Manes Barton; Oregon, W. T. Frost; Utah, Gregory L. Pearson; Washington, Robert T. Davis; Wyoming, George W. Peak.

California....Dept. of Water Resources, Robert W. Miller, Chief, Water Supply Forecast and Snow Surveys Unit.

British Columbia....Dept. of Lands, Forests, and Water Resources, Harry I. Hunter, Meteorologist, Water Resources Service.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
D. A. WILLIAMS, ADMINISTRATOR



April - September, 1964
PROSPECTIVE STREAMFLOW
as of February 1, 1964

WATER SUPPLY OUTLOOK
As of February 1, 1964

AS OF MID-WINTER, WATER SUPPLY OUTLOOK FOR WESTERN IRRIGATED AREAS RANGES FROM FAVORABLE IN THE PACIFIC NORTHWEST AND CALIFORNIA TO A SEVERE SHORTAGE IN LARGE AREAS OF THE SOUTHERN ROCKY MOUNTAINS AND THE COLORADO RIVER BASIN.

At about the mid-point in the snow accumulation season, irrigation water supply outlook varies from favorable in the west coast states, Idaho and western Nevada to rather substantial shortages on the Arkansas and Rio Grande. Snowpack on the source areas of the Colorado River and its tributaries in Utah and Arizona is much below average to this date. Most extreme shortages of water from the standpoint of irrigation are in prospect for the Arkansas and Rio Grande and south central Utah.

Until a month ago, seasonal snowfall had been light over all the west. January snowfall tended to be excessive in the northern half of the mountain states with almost record accumulations on the Cascade Range of Oregon and Washington. The storms which brought this precipitation extended in a lesser degree to western Idaho and to the central Sierras of California and Nevada.

For most areas of the west, snowpack is far in excess of that which existed on February 1 a year ago. Heavy snowfalls after late March last year, which persisted till early June, resulted in a good water supply in west coast states. That was a substantial improvement over the earlier season outlook through Nevada to Utah. That late season improvement in water outlook was an extreme departure from the normal weather sequence.

Some degree of water shortage could occur this summer in all areas east of the Continental Divide which are not immediately along the Missouri, the Yellowstone or Bighorn rivers. Irrigated areas of eastern Colorado and central New Mexico face the most severe shortage unless mountain snowpack improves radically before the melt season. Surface water supplies for Arizona and southern Utah are also less than average.

If snowfall for the remainder of the winter season is near or above average, water supplies in the Columbia Basin should be adequate to meet all usual demands.

Outlook for the large Central Valley of California is good, according to the California Department of Water Resources. Carryover storage from the 1963 season was excellent, and snowpack in the central and northern Sierras is near average for this date. Snowpack declines rapidly in respect to average from central California toward the southern end of the San Joaquin Valley. As usual, southern California will have to depend on imported water almost entirely.

Storage in irrigation reservoirs of the west is less than average for this date and tends to be less than for a year ago on this date, particularly in Wyoming, Colorado, New Mexico and Arizona.

MISSOURI BASIN

February 1 snowpack over the Missouri Basin varies widely, from slightly less than average on the headwaters of the Upper Missouri to a substantial deficiency on the South Platte watershed in Colorado. If the present snowfall deficiency continues, there could be limited shortages of water for irrigation along smaller tributaries to the Bighorn and on the heavy use areas of the North and South Platte.

MONTANA

Snow accumulation to date on the headwaters of the Missouri tributaries above Three Forks is about 90 percent of average and somewhat greater than on February 1, 1963. The Yellowstone has a snowpack about 80 percent of average. Storage in reservoirs on the main stem streams is near average and similar to a year ago.

Irrigation water supplies are expected to be generally adequate. However, if late season snowfall is less than average, shortages could occur on the Milk and Marias river drainages and on Rock Creek and Red Lodge Creek tributaries to the Yellowstone.

Mountain soils tend to be dry under the snowpack. Storage in irrigation reservoirs is substantially below average and less than for a year ago on this date.

WYOMING

Mountain snowpack to February 1 is substantially less than average on both the Bighorn and North Platte drainages. Should the trend of less than average snowfall continue, there could be late season water shortages on the Wind and Popo Agie and on the smaller tributaries to the Bighorn in the Powell Basin.

Storage on the North Platte and prospective inflow to Seminoe Reservoir is adequate to meet most normal demands for irrigation water in this area. However, there may be problems for irrigators having low priority if the outlook for water declines later in the winter season.

COLORADO (South Platte)

Snow accumulation to date is near the minimum of record for the South Platte drainage. Depending on subsequent snowfall, streamflow for 1964 is now expected to range substantially less than average. Carryover storage is near average in the irrigation reservoirs, the municipal reservoirs and those of the Colorado-Big Thompson system. Total storage in the basin is substantially less than for a year ago. The general outlook can be considered as only fair, even with supplemental water now in storage west of the Divide.

ARKANSAS BASIN

The outlook for irrigation water along the Arkansas and its tributaries in Colorado and western Kansas is not favorable at this time. The general outlook is comparable to a year ago. Mountain snowfall to date, at about 70 percent of average for February 1, is even more deficient than last year. Storage for the 1964 season is almost non-existent. Recent storms brought some moisture to the plains, but the storms did not extend to the high mountain watersheds.

Snowpack on the high mountain headwaters of the Canadian River in New Mexico is also extremely deficient. Storage in Conchas Reservoir is relatively low, one-half to one-third of that which has been carried over in recent years. Unless there is substantial increase in the snowpack for the remainder of the winter season, a short water season is anticipated for this watershed.

RIO GRANDE BASIN

Snowfall on the Rio Grande headwaters in Colorado and northern New Mexico is again extremely deficient, less than half of average for this date.

The outlook for 1964 along the Rio Grande is comparable to that which occurred during the 1963 water year, which was among the poorest water supply years of record.

Reservoir storage in San Luis Valley, as well as on the Rio Chama and the Lower Rio Grande, is extremely low, just nominally above the minimum of record.

The shortages will extend to the smaller Rio Grande tributaries in both states. Water supply outlook along the Pecos is somewhat better than for the main stem of the Rio Grande but less than both average and a year ago. Surface water supplies will be short of meeting water demands.

COLORADO BASIN

The flow of the Colorado River and its tributaries is expected to be only slightly greater than for the extremely low year of 1963. While snowfall to date is somewhat ahead of February 1 a year ago, it is still far short of average except for the headwaters of the Green in Wyoming. Inflow to Lake Powell is forecast at about 5,500,000 acre-feet, or about 60 percent of average.

COLORADO

Snow accumulation to date is much less than average on the Upper Colorado and its tributaries, with extreme deficiencies along the San Juan Range and on the Grand Mesa. Local water shortages are not expected for the larger tributaries except for the Dolores, where demands will probably exceed supply. Minor tributaries without storage will be short of water in late season. Storage for the Colorado-Big Thompson is about average and half of capacity. Inflow to Granby will be less than available storage capacity. The other major reservoirs, Taylor Park and Vallecito, have about one-half of their usual carryover.

UTAH

Snowfall to date on Colorado tributaries in Utah is about one-half of average, but is generally well in excess of the extremely low snow measurements obtained on February 1, 1963. Outlook along the Duchesne and Price rivers and their tributaries is poor, almost comparable to that of a year ago. Storage in the larger irrigation reservoirs is also similar to that of last year.

ARIZONA

As of February 1, the total of prospective streamflow and reservoir storage indicates a

SUMMARY OF SNOW WATER EQUIVALENT MEASUREMENTS FEBRUARY 1, 1964

MAJOR BASIN AND SUB — WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
MISSOURI BASIN		
Jefferson	115	82
Madison	154	88
Gallatin	88	96
Missouri Main Stem	108	108
Yellowstone	122	82
Shoshone	125	84
Wind	122	70
North Platte	144	77
South Platte	100	62
ARKANSAS BASIN		
Arkansas	81	69
Canadian	59	48
RIO GRANDE BASIN		
Rio Grande (Colo.)	42	39
Rio Grande above Otowi Bridge	55	37
Pecos	48	63
COLORADO BASIN		
Green (Wyo.)	140	79
Yampa - White	125	75
Duchesne	134	48
Price	200	48
Upper Colorado	96	56
Gunnison	113	75
San Juan	65	40
Dolores	110	53
Virgin	429	42
Gila	37	26
Salt	79	49
GREAT BASIN		
Bear	111	79
Logan	285	89
Ogden	227	86
Weber	176	70
Provo - Utah Lake	148	62
Jordan	194	77
Sevier	499	42
Walker - Carson	800	70
Tahoe - Truckee	640	82
Humboldt	295	85
Lake Co. (Oregon)		117
Harney Basin (Oregon)	374	97
UPPER COLUMBIA BASIN		
Columbia (Canada)	135	118
Kootenai	105	78
Clark Fork	123	106
Bitterroot	187	108
Flathead	150	84
Spokane	162	103
Okanogan	228	105
Methow	155	107
Chelan	128	88
Wenatchee	275	105

MAJOR BASIN AND SUB — WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
SNAKE BASIN		
Snake above Jackson, Wyo.	149	82
Snake above Hiese, Idaho	145	86
Snake above American Falls Res	140	88
Henry's Fork	136	88
Southern Idaho Tributaries	210	102
Big and Little Wood	142	99
Boise	172	92
Owyhee	312	97
Payette	132	85
Malheur	312	97
Weiser	191	96
Burnt	320	99
Powder	222	91
Salmon	140	97
Grande Ronde	230	98
Clearwater	173	113
LOWER COLUMBIA BASIN		
Yakima	312	125
Umatilla	382	110
John Day	350	95
Deschutes	465	102
Hood	577	104
Willamette	610	104
Lewis	276	124
Cowlitz	257	126
PACIFIC COASTAL BASIN		
Puget Sound	250	130
Olympic Peninsula	154	77
Umpqua - Rogue	472	104
Klamath	415	106
Trinity	600	90
CALIFORNIA CENTRAL VALLEY		
Upper Sacramento	560	85
Feather		95
Yuba		95
American	630	95
Mokelumne	270	80
Stanislaus	320	80
Tuolumne	300	75
Merced	470	70
San Joaquin	215	65
Kings	185	55
Kaweah	185	55
Tule	165	50
Kern	150	45

Data for California Watersheds supplied by Dept. of Water Resources, and for British Columbia Watersheds by Dept. of Lands, Forests and Water Resources.

Average is for 1943-57 period.

Based on Selected Snow Courses determined by Distribution within the Basin, Length of Record and Repetitive Monthly Measurement Schedules.

SELECTED STREAMFLOW FORECASTS APRIL - SEPTEMBER AS OF FEBRUARY 1, 1964

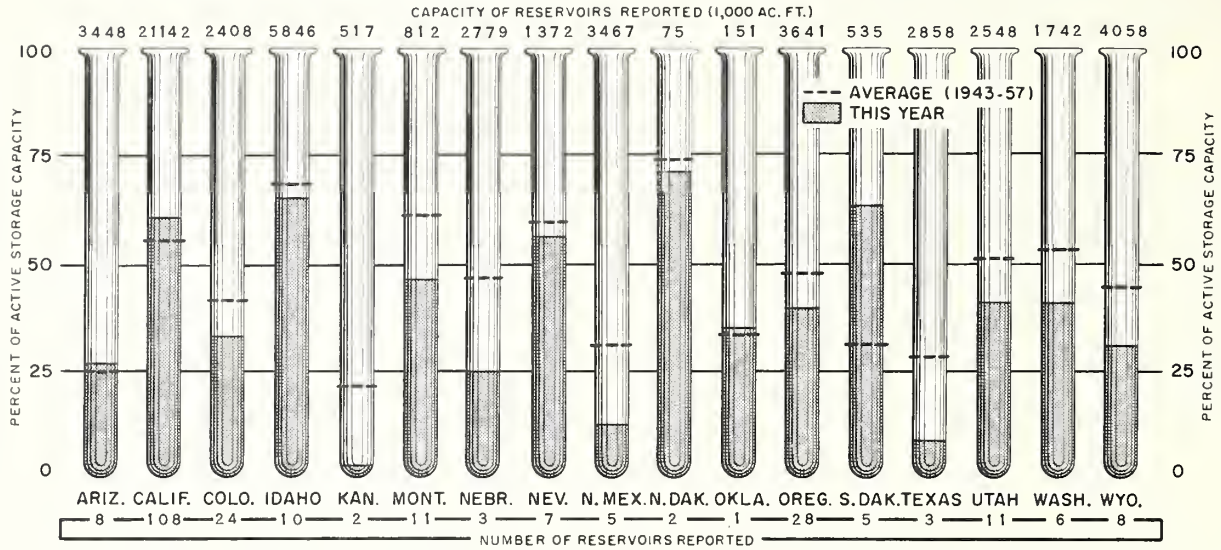
STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW 1963	FORECAST 1964	
UPPER MISSOURI			
Clark Fork at Chance, Montana	593		
Gallatin near Gateway, Montana	455		
Jefferson at Sappington, Montana	972		
Madison near Grayling, Montana 1/	430		
Missouri near Zortman, Montana 2/			
Missouri near Williston, N. Dakota 3/	10687		
Yellowstone at Corwin Springs, Montana	1935		
Yellowstone at Miles City, Montana			
Shoshone below Buffalo Bill Res., Wyoming 4/		766	90
Wind at Dubois, Wyoming		91	91
PLATTE			
Clear at Golden, Colorado 5/	64	100	73
North Platte at Saratoga, Wyoming		465	70
Cache LaPoudre near Ft. Collins, Colorado 6/		125	66
ARKANSAS			
Arkansas at Salida, Colorado 7/	277	205	61
RIO GRANDE			
Rio Grande near Del Norte, Colorado 8/	263	300	45
Rio Grande at Otowi Bridge, New Mexico 9/		285	52
Pecos at Pecos, New Mexico *		25	52
UPPER COLORADO			
Animas at Durango, Colorado		325	68
Colorado at Glenwood Springs, Colorado 10/		1100	71
Colorado near Cisco, Utah	1555	2650	65
Colorado near Grand Canyon, Arizona 11/	3843	5500	60
Duchesne near Tabiona, Utah 12/		90	72
Green, Inflow to Flaming Gorge Res.	645	1260	86
Green near Green River, Utah 13/	1835	2750	78
Gunnison near Grand Junction, Colorado		900	65
Price near Scofield, Utah 14/		28	70
San Juan near Bluff, Utah 15/	565	500	40
White at Meeker, Colorado		275	82
Yampa at Steamboat Springs, Colorado		220	78
LOWER COLORADO			
Gila near Solomon, Arizona (Jan-May)	126	49	52
Salt at Intake, Arizona (Jan-May)	206	110	40
Verde above Horseshoe Dam, Arizona (Jan-May)	59	67	35
GREAT BASIN			
Bear at Harer, Idaho 16/		195	65
Logan near Logan, Utah 17/	103	125	88
Ogden, Inflow to Pine View Res., Utah 18/ (Mar-July)	86	115	81
Provo at Vivian Park, Utah 19/		105	66
Sevier at Hatch, Utah 20/	20	25	51
Sevier near Kingston, Utah		8	27
Humboldt at Palisades, Nevada **	216	165	73
Truckee at Farad, California ** 21/	277		
West Walker near Coleville, California **	173	120	81

Forecasts in California provided by Department of Water Resources.
Average is for 1943-57 period except California. California is computed for 1908-57 period.
Forecasts assume average Effective Climatic Conditions from Date Through Snow Melt Season.

SELECTED STREAMFLOW FORECASTS APRIL - SEPTEMBER AS OF FEBRUARY 1, 1964

STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW 1963	FORECAST 1964	
UPPER COLUMBIA			
Bitterroot near Darby, Montana	532		
Chelan at Chelan, Washington 22/			
Clark Fork above Missoula, Montana	1430		
Clark Fork at Whitehorse Rapids, Montana 23/			
Columbia at Revelstoke, British Columbia			
Columbia at Birchbank, British Columbia 24/	41100		
Columbia at Grand Coulee, Washington 24/	58000	68800	102
Columbia at The Dalles, Oregon 24/	86290	106700	101
Flathead near Polson, Montana 23/	5702		
Kootenai at Wardner, British Columbia			
Kootenai at Leonia, Idaho	8001		
Okanogan near Tonasket, Washington			
Spokane at Post Falls, Idaho 25/	1823	3000	92
SNAKE			
Big Lost, Inflow to Mackay Res., Idaho 26/	178	180	105
Big Wood, Inflow to Magic Res., Idaho 27/	251	275	89
Boise above Diversion Dam, Idaho 28/	1304	1650	96
Clearwater at Spalding, Idaho	6321	8700	96
Malheur near Drewsey, Oregon	65	80	99
Owyhee Res. Net Inflow, Oregon 18/	271	466	108
Payette near Horseshoe Bend, Idaho 29/	1626	1970	98
Salmon at Whitebird, Idaho	6721	7000	98
Snake near Heise, Idaho 30/	3357	3800	92
Snake at Weiser, Idaho	6212		
LOWER COLUMBIA			
Cowlitz at Castle Rock, Washington			
Deschutes at Benham Falls, Oregon 31/		530	88
Grande Ronde near LaGrande, Oregon		190	94
Hood near Hood River, Oregon 32/	250	381	104
Willamette at Salem, Oregon 33/		5178	95
Yakima near Parker, Washington 34/			
NORTH PACIFIC COASTAL			
Dungeness near Sequin, Washington			
Rogue at Raygold near Central Point, Oregon		995	99
Klamath Lake, Net Inflow, Oregon 35/	572	620	98
CALIFORNIA CENTRAL VALLEY 36/**			
American, Inflow to Folsom Res., Calif.	1755	1160	84
Feather near Oroville, Calif.	2653	1790	92
Kaweah near Three Rivers, Calif. 37/	332	210	80
Kern near Bakersfield, Calif.	476	240	55
Kings, Inflow to Pine Flat Res., Calif.	1388	850	72
Merced, Inflow to Exchequer Res., Calif.	677	415	67
Mokelumne, Inflow to Pardee Res., Calif.	565	360	75
Sacramento, Inflow to Shasta Res., Calif.	2995	1820	102
San Joaquin, Inflow to Friant Res., Calif.	1413	810	67
Stanislaus, Inflow to Melones Res., Calif.	842	560	76
Tule, Inflow to Success Res., Calif.	65	33	59
Tuolumne, Inflow to Don Pedro Res., Calif.	1435	920	76
Yuba at Smartville, Calif.	1430	1000	89

Explanatory Notes on Forecasts Listed on Inside Back Cover.
** April - June Period ** April - July Period*



Kansas storage is in John Martin and Great Plains Reservoirs in Colorado. Texas storage is in Red Bluff in Texas and Elephant Butte and Caballo in New Mexico. Nebraska storage on North Platte above Kingsley Reservoir in Wyoming and Nebraska.

Reservoir storage data supplied by Bureau of Reclamation, Geological Surveys and water using organizations.

below average surface water supply for the central Arizona irrigated area for 1964. Snow cover as of February 1 is only one-third of average for the date. This snow situation is not unusual for the limited snowfall that occurs in the mountains of the state. Mountain soil moisture is relatively good.

Storage in the Salt River reservoirs is slightly in excess of the past 15-year average but somewhat less than for this date a year ago. For the San Carlos project, storage is two-thirds of average and slightly less than for a year ago. Reservoir inflow has been extremely low during the winter months.

A continuing reliance on groundwater supplies appears to be in order for the 1964 season.

GREAT BASIN

UTAH

The outlook for the Bear River and its tributaries in northern Utah is fair to good at this time, but shortages could occur if late season snowfall is much below average. Most probable streamflow forecasts are now 80 to 90 percent of average, a substantial improo
provement over the outlook of a year ago. Snow cover is slightly less than average for this date.

For the Sevier River drainage of central Utah, water supply outlook is again poor. While there is considerably more snow on the watersheds than for this date in 1963, snowpack to date is less than one-half of average. Reservoir storage is much below average and comparable to a year ago.

NEVADA

The 1964 irrigation season water supply outlook is good in western and northern Nevada, particularly for water users served in part from reservoirs. Mountain snow water accumulation to date has been near normal. Reservoir storage is 93 percent of February 1 average. Mountain soil moisture is good in northern and western Nevada.

The storm system which moved through Nevada during January 16-23 deposited heavy amounts of snow in the mountains in the central Sierras. Snowfall from that storm decreased from north to south with only small quantities falling in Esmeralda, Nye, Lincoln and Clark counties.

COLUMBIA BASIN

Increase in snow cover over the western section of the Columbia Basin during the month of January was near the maximum of record. However, snow accumulation to Jan-

STORAGE IN LARGE RESERVOIRS — FEBRUARY 1, 1964

BASIN AND NAME OF RESERVOIR	CAPACITY (1000 A.F.)	STORAGE (1000 A.F.)
UPPER MISSOURI		
Boysen	560	306
Buffalo Bill	380	161
Canyon Ferry	2043	1732
Hebgen	385	211
Tiber	1316	642
Belle Fourche	185	124
Keyhole	190	71
Fort Peck	19410	11720
Fort Randall	6100	2488
Garrison	24500	14386
Oahe	23600	7678
PLATTE		
Glendo	786	292
Pathfinder	1011	113
Seminoe	982	289
Colo-Big Thompson (4)	865	473
City of Denver (4)	218	104
ARKANSAS		
Conchas	600	100
John Martin	367	4
RIO GRANDE		
Elephant Butte	2207	128
El Vado	194	3
UPPER COLORADO		
Flaming Gorge	3789	893
Navajo	1709	332
Powell	28040	3113
LOWER COLORADO		
Havusu	619	547
Mead	27207	15448
Mohave	1810	1696
San Carlos	1206	65
Salt River Res. (4)	1755	779
Verde River Res. (2)	322	19
GREAT BASIN		
Bear	1421	709
Lahontan	286	213
Rye Patch	179	75
Sevier Bridge	236	36
Strawberry	270	53
Tahoe	732	379
Utah	1149	262

BASIN AND NAME OF RESERVOIR	CAPACITY (1000 A.F.)	STORAGE (1000 A.F.)
UPPER COLUMBIA		
Chelan	676	318
Coeur d'Alene	238	105
Flathead	1791	1591
Hungry Horse	3428	2437
Kootenay	817	485
Pend Oreille	1155	613
Roosevelt	5072	4118
LOWER COLUMBIA		
Detroit	300	165
Hills Creek	200	145
Lookout Point	337	146
Yakima Res. (5)	1065	421
SNAKE		
American Falls	1700	1102
Arrowrock	287	277
Anderson Ranch	423	261
Brownlee	1427	782
Cascade	653	328
Jackson	847	633
Lucky Peak	278	82
Palisades	1202	875
Owyhee	715	286
PACIFIC COASTAL		
Clear Lake	440	99
Upper Klamath	584	280
Ross	1203	1162
Trinity	2500	2239
CALIFORNIA CENTRAL VALLEY		
Almanor	650	653
Berryessa	1600	1557
Cachuma	206	167
Casitas	248	46
Cherry Valley	268	110
Don Pedro	260	112
Folsom	1010	505
Hetch-Hetchy	360	166
Isabella	552	169
McClure	281	132
Millerton	503	370
Nacimiento	350	198
Pardee	210	193
Pine Flat	1001	616
Shasta	4500	3206

Reservoir Storage Data Provided by Bureau of Reclamation, Corps of Engineers, Geological Survey, and water using organizations. Data from California and British Columbia provided by Department of Water Resources and Department of Lands, Forests and Water Resources, respectively.

uary 1 was generally deficient except for the northern Cascades of Washington and the Columbia-Fraser Divide of British Columbia. As of February 1, the seasonal snow accumulation ranges near average, with a slight deficiency along the Continental Divide and a limited excess west of the Columbia River in British Columbia, and on the headwaters of the Okanogan, Yakima, Lewis and Cowlitz rivers.

Water supply outlook for both power and irrigation is good throughout the basin. With limited water demands in 1963, storage for the major irrigated areas of the Snake River and its tributaries has been restored to near normal operating levels. If the rate of snow accumulation is near average for the remainder of the winter season, water supply should be reasonably adequate for 1964.

The flow of the Columbia at The Dalles, Oregon is forecast at 107,000,000 acre-feet or 101 percent of average for the April-September 1964 period.

BRITISH COLUMBIA

The Water Resources Service reports that water supplies are expected to be adequate for all areas of British Columbia this coming season. January increases in snowpack were well above average in the western section of the Columbia and on the Fraser River Basin. As of February 1, snow accumulation is above average on the Lower Coastal, Bridge, Nechako, Similkameen, South Okanogon and southwestern Kootenay watersheds. Elsewhere in the province, mountain snowpacks are near average.

On Vancouver Island, snowpack is particularly heavy, extending to low elevations.

MONTANA

If snowpack for the remainder of the season ranges near average, flow of Columbia River tributaries can be expected to be slightly less than average and will be adequate to meet power and irrigation requirements. Present snowpack at high elevations is slightly less than average, but snowpack at valley elevations is relatively good.

IDAHO

The flow of major streams in Idaho is expected to be near average for the 1964 season. Because of lack of demand during the 1963 water year, carryover storage in the larger reservoirs along the Snake and its western Idaho tributaries is good. January snowfall has been far above average at foothill and valley elevations, but slightly below average at high mountain elevations. Typically, February 1 snow cover ranges from 90 to 100 percent of average and slightly higher on the Clearwater. Soils under the snow are generally wet. If the present trend of snow accumulation continues, a good water season is in prospect for the major irrigated areas of Idaho.

OREGON

As of this mid-winter date, water supply outlook is quite favorable, especially as compared to a month ago. The increase in snowpack in the Cascade Range during January was a maximum of record. State-wide snowpack increased from 45 percent of average on January 1 to 100 percent of average on February 1. The greatest increase, 34 inches of water, occurred on a snow course on Mt. Hood near the 6000 foot level. Soil moisture under the snow is generally well re-charged and soil will take up relatively small amounts of water during the snowmelt period. Reservoir storage, while generally below average, is satisfactory except for McKay Reservoir near Pendleton.

Water supply outlook for irrigation in Lake and Harney counties in the interior basin area is good.

WASHINGTON

Water supply outlook for the Columbia and tributary streams is excellent as of this date. Snow surveys as of February 1 indicate snowpack near average on the east slope of the Cascades and well in excess of average on Puget Sound streams and on the Yakima, Lewis and Cowlitz rivers, tributaries to the lower Columbia. Limited areas of shortage last year on Okanogan tributaries and near Walla Walla should have adequate supplies this year.

Reservoirs that are used for irrigation or power generally have less water in storage than average for this time of year. With the present above normal snowpack, these reservoirs should easily fill during the spring runoff.

CALIFORNIA

The California Department of Water Resources, coordinating agency for snow surveys and water supply forecasting in California, reports that California water users are again faced with a year of prudent water management. However, the general water conditions are such that California will not suffer from water shortages this spring and summer. February 1 data indicates that no adverse combination of water supply factors are prominent in the state, although many agencies will be required to depend substantially upon stored water.

Assuming normal precipitation during the remainder of the season, runoff forecasts for

the April-July period range from a low of 55 percent for the Kern River to 100 percent for the inflow to Shasta reservoir. Southern California will again experience a dry year in which runoff is not expected to exceed 50 percent of average amounts.

Even with below normal forecasts of streamflow, extreme shortages are not indicated because of normal and above normal reservoir storage. This favorable condition is due in part to the late precipitation occurring last spring which permitted general storage gains well into heavy water demand season. The light early season use resulted in better than average carryover in many reservoirs, especially in the Central Valley.

The January 21 and 22 storm which reached blizzard conditions over the Central Sierras left snow at unusual elevations of 1000 feet and lower. Light snow fell briefly at the Sacramento airport, elevation 25 feet, 2 inches accumulating at Roseville, elevation at 160 feet; and 10 inches piled up on Mt. Diablo in the coast range. The snowpack in the Central Sierra reached depths of 12 feet, tapering off to depths of 3 feet in the Southern Sierra.

Distribution of precipitation this season was strongly biased by the mid-January storm, and its path of heaviest rainfall through Central California. Precipitation from October 1 to date in the San Francisco Bay and Sacramento Valley areas stands at 90 to 95 percent of normal. Totals to date taper off to 80 percent of normal in the San Joaquin Valley, 65 percent in the South Coastal area, and dropped below 50 percent of normal in the South Lahontan and Owens Valley regions. The North Coast area, benefiting by the fringes of January storms sweeping across Oregon and Washington, has experienced 100 to 110 percent of normal precipitation.

Snowpack measurements on or about February 1 show that the present snowline ranges from about 2000 feet in the Merced and Tuolumne basins to 3000 feet in the northern half of the state. In the South Sierra, the snowline is about 5000 feet.

The distribution of California's high elevation snowpack follows the precipitation pattern of the mid-January storm, with Central Sierra snow accumulation standing at 95 percent of normal for this date. As with precipitation, the pack tapers off to 90 percent of normal to the north and drops as low as 40 percent of normal in the South Sierras.

Reservoirs throughout the state are near or above normal storage levels for this date, comparable to those for this date last year. Compared with the "no snow" conditions of last February, this year's snowpack with the existing storage, assures firm yield conditions in most areas.

Unimpaired runoff for the October through January period varied from about 55 percent of normal in the San Francisco Bay area to near normal in the Sacramento Valley. Runoff of most major streams in the San Joaquin Valley ranged from 90 to 100 percent of normal. The periodic storms over the North Coastal areas during recent months resulted in runoff ranging from 115 to 130 percent of normal for this period. The Central and Southern watersheds of the Lahontan area also had above normal runoff generally in the range of 135 percent of normal. Conversely, in the South Coastal area, below normal precipitation resulted in runoff which approximated only 30 percent of normal in local streams, a condition becoming increasingly habitual for this area.

EXPLANATION of STREAMFLOW FORECASTS

1/ Observed flow adjusted for change in storage in Hebgen Lake. 2/ Observed flow adjusted for change in storage in Canyon Ferry and Tiber reservoirs. 3/ Observed flow adjusted for change in storage in Canyon Ferry, Tiber, Fort Peck, Buffalo Bill, and Boysen reservoirs. 4/ Observed flow adjusted for change in storage in Buffalo Bill Reservoir plus Heart Mt. Diversion. 5/ Observed flow minus diversion through Jones Pass Tunnel.

6/ Observed flow minus diversions from North Platte, Colorado, and Laramie rivers plus measured diversions for irrigation and municipal use above station. 7/ Observed flow adjusted for change in storage in Clear Creek, Twin Lakes, and Sugar Loaf reservoirs minus trans-mountain diversions through Busk-Ivanhoe and Twin Lakes tunnels and Ewing, Fremont, Wurtz, and Columbine ditches. 8/ Observed flow adjusted for change in storage in Santa Maria, Rio Grande, and Continental reservoirs. 9/ Observed flow adjusted for changes in storage in reservoirs listed in (8) plus Terrace, Sanchez, Platoro, and El Vado reservoirs. 10/ Observed flow adjusted for changes in storage in Granby Reservoir plus diversions through Adams Tunnel and Grand River Ditch.

11/ Observed flow adjusted for changes in storage in Flaming Gorge, Navajo, and Lake Powell. 12/ Observed flow plus diversion through Duchesne Tunnel. 13/ Observed flow adjusted for changes in storage in Flaming Gorge and Big Sandy reservoirs. 14/ Observed flow adjusted for change in storage in Scofield Reservoir. 15/ Observed flow adjusted for change in storage in Navajo Reservoir.

16/ Observed flow. 17/ Observed flow plus Utah Power and Light Tailrace and Logan, Hyde Park, and Smithfield canals. 18/ Record computed by Bureau of Reclamation. 19/ Observed flow adjusted for change in storage in Deer Creek Reservoir, minus diversions through Duchesne Tunnel and Weber-Provo Canal, plus diversion through Salt Lake Aqueduct. 20/ Observed flow.

21/ Observed flow exclusive of Lake Tahoe and adjusted for change in storage in Boca Reservoir. Forecast by Truckee Basin Water Committee. 22/ Observed flow adjusted for change in storage in Lake Chelan. 23/ Observed flow adjusted for change in storage in Flathead and Hungry Horse reservoirs. 24/ Observed flow adjusted for change in storage in any or all of the following reservoirs above the station: Kootenay, Hungry Horse, Flathead, Pend Oreille, Coeur d'Alene, F. D. Roosevelt, Lake Chelan, Noxon, and Brownlee; and pumping from F.D.R. Lake. 25/ Observed flow adjusted for change in storage in Coeur d'Alene Lake plus diversions to Spokane Valley Farms and Rathdrum Prairie canals.

26/ Observed flow adjusted for change in storage in Mackay Reservoir plus diversion in Sharp Ditch. 27/ Combined flow of Big Wood near Belleview and Camas Creek near Blaine. 28/ Observed flow adjusted for changes in storage in Lucky Peak, Anderson Ranch, and Arrowrock reservoirs. 29/ Observed flow adjusted for changes in storage in Cascade and Deadwood reservoirs. 30/ Observed flow adjusted for changes in storage in Palisades and Jackson reservoirs.

31/ Observed flow adjusted for changes in storage in Crane Prairie, Wickiup, and Crescent Lake reservoirs. 32/ Adjusted to natural flow. 33/ Observed flow adjusted for changes in storage in Lookout Point, Detroit, Cottage Grove, Dorena, and Hills Creek reservoirs. 34/ Observed flow adjusted for changes in storage in Keechelus, Kachess, Cle Elum, Bumping, and Tieton reservoirs, plus diversions by Rosa, New Reservation, Old Reservation, and Sunnyside canals. 35/ Flow records provided by PP&L and USBR.

36/ All forecasts are for unimpaired streamflow except Kaweah River. 37/ Not corrected for upstream impairments. All other forecasts are for observed flow.

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